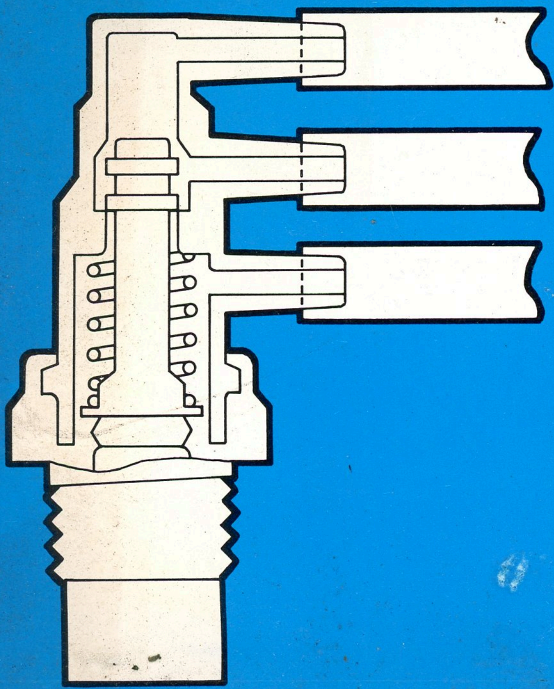
AMC | Jeep®

American Motors
Sales Corporation

EMISSION CONTROLS
PART-II



FILM REFERENCE BOOK

718779601RB

In-dealership Service Training

INTRODUCTION

This film reference book contains many of the testing, adjustment and other maintenance procedures used to correctly service some of the AMC and Jeep emission controls systems.

Before you perform any of these procedures, be sure to view the film "Emission Controls — Part II." The film, which is the second in a two-part series, explains the function and theory-of-operation behind each system included in this reference book.

The "Emission Controls — Part I" film and film reference book are also being shipped to your dealership. The first film covers the other AMC and Jeep emission controls systems. Be sure to study these materials *before* you study "Emission Controls — Part II."

All the information and specifications in this reference book are based on the latest data available at the time of publication. American Motors Corporation reserves the right to discontinue models and change specifications or design without notice or incurring obligation.

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SPARK CONTROL SYSTEMS

Manifold vacuum and carburetor ported vacuum are both used to provide signals for the ignition spark advance mechanism.

On some engines, a coolant temperature override (CTO) switch chooses the proper vacuum source, depending upon coolant temperature.

On other engines, a non-linear vacuum regulator (NLRV) valve combines regulated vacuum at idle speed. At speeds above idle, carburetor ported vacuum is provided, based on engine load.

On yet another system, the transmission-controlled spark (TCS) system, the transmission also controls spark advance.

Be sure to view the film "Emission Controls — Part II" for complete explanations of these systems.

THE SPARK COOLANT TEMPERATURE OVERRIDE (CTO) SYSTEM

The CTO Switch is the heart of this system. The procedure you should be familiar with here is the CTO switch operational test.

The CTO Switch Operational Test

These are three types of spark CTO switches used on AMC and Jeep vehicles:

- Standard CTO Switch
- Dual-Function CTO Switch
- Heavy-Duty Cooling CTO Switch

SPARK CONTROL SYSTEMS

Testing the Standard CTO Switch

To test the operation of the standard CTO switch, follow the procedure shown in Figure 1.

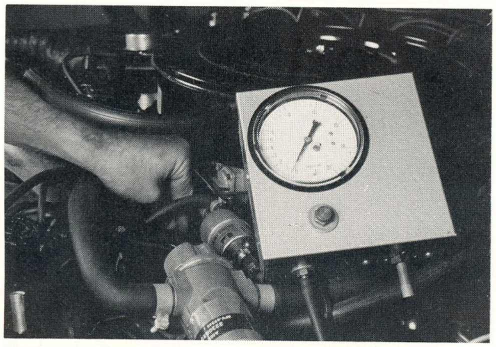

Figure 1. Connect a vacuum gauge to port "D" of the switch. Start the engine. When the engine is cold (below 160° F), manifold vacuum should be indicated. When it is warm (above 160° F), carburetor ported vacuum should be indicated.

NOTE: Ported vacuum is not available when the throttle is closed. Ported vacuum is available only when the throttle is open enough to achieve an engine speed of 1000 rpm.

If the switch is defective, it must be replaced.

Testing the Dual-Function CTO Switch

To test the operation of the dual-function CTO switch, follow the procedure shown in Figure 2.

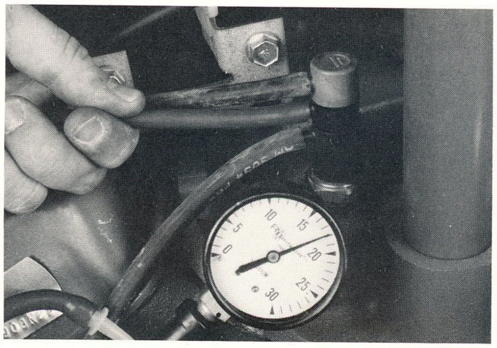

Figure 2. Connect a vacuum gauge to port 2 of the switch. Start the engine. When the engine temperature is below 149° F, manifold vacuum should be indicated. If the engine temperature reaches approximately 149° F, carburetor ported vacuum should be indicated. When the engine temperature reaches approximately 220° F manifold vacuum should be indicated.

NOTE: Ported vacuum is not available when the throttle is closed. Ported vacuum is available only when the throttle is open enough to achieve an engine speed of 1000 rpm.

If the switch is defective, it must be replaced.

Testing the Heavy-Duty Cooling CTO Switch

To test the operation of this CTO switch, which is used in conjunction with some heavy-duty cooling systems, follow the procedure shown in Figure 3.

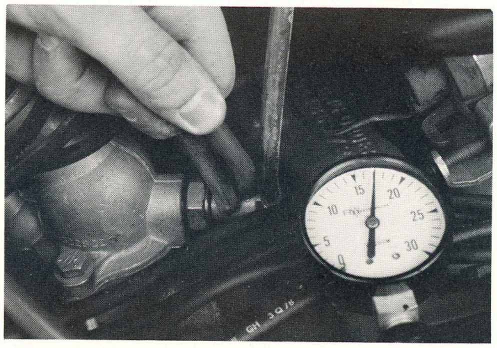

Figure 3. Connect a vacuum gauge to port "D". Start the engine. When the engine is running at normal operating temperature, a vacuum signal should be indicated. In the event of an engine overheat (225° F), manifold vacuum should be indicated.

If the switch is defective, it must be replaced.

SPARK CONTROL SYSTEMS

THE NON-LINEAR VACUUM REGULATOR (NLRV) VALVE

In this system, a vacuum signal somewhere between intake manifold vacuum and carburetor ported vacuum is provided when the engine is idling. As engine load increases, the spark is advanced by ported vacuum only.

The NLRV valve is the heart of the system. There are two procedures you should be familiar with here:

- **The NLRV Valve Operational Test**
- **NLRV Valve Replacement**

The NLRV Valve Operational Test

To test the operation of the NLRV valve, follow the procedure shown in Figure 4.

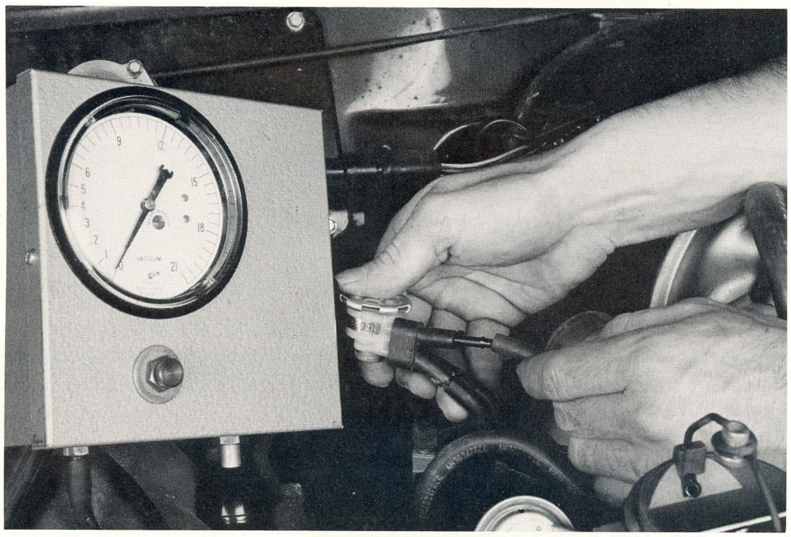

Figure 4. Connect a vacuum gauge to the port marked "Dist." Start the engine. With the engine idling, a vacuum reading of 7 in. Hg should be indicated. Open the throttle gradually. As engine speed increases, ported vacuum from the carburetor should be indicated.

If the valve is defective, it must be replaced.

SPARK CONTROL SYSTEMS

THE TRANSMISSION-CONTROLLED SPARK (TCS) SYSTEM

There are several test procedures you should be familiar with in regard to the TCS system:

- **The CTO Switch Operational Test**
- **The Current Supply Test**
- **The Ground Circuit Test**
- **The Solenoid Control Switch Test**
- **The Solenoid Vacuum Valve Function Test**
- **The Vacuum Spark Control Check Valve Test**

The CTO Switch Operational Test

This switch is the standard CTO switch. For this test procedure, refer to the section "Testing the Standard CTO Switch" on page 3.

The Current Supply Test

To check for current at the solenoid vacuum valve, follow the procedure shown in Figure 5.

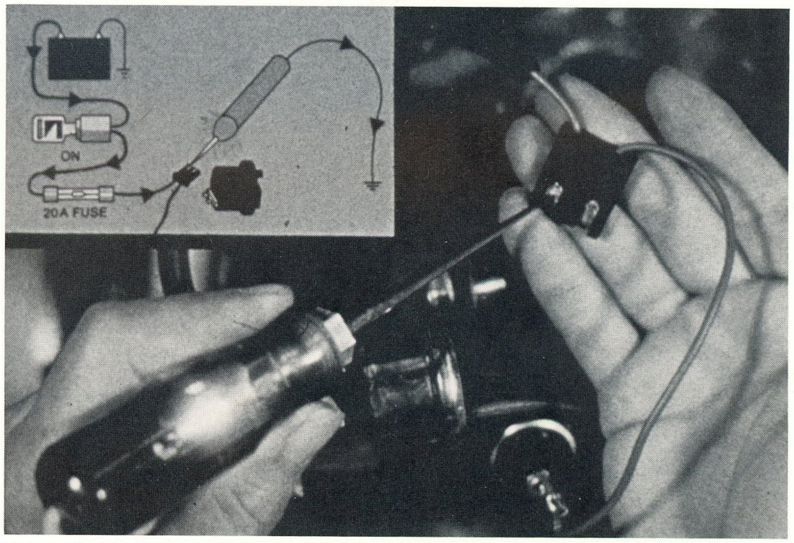

Figure 5. Disconnect the wire connector from the solenoid vacuum valve.

With the ignition "On," touch the probe of a properly grounded test lamp to each terminal. (The test lamp should light when touched to the terminal of the ignition feed wire; if not, the ignition feed to the TCS is defective.)

SPARK CONTROL SYSTEMS

The Ground Circuit Test

To test the signal received by the solenoid vacuum valve from the solenoid control switch, support the vehicle so that the drive wheels are off the ground and follow the procedures shown in Figures 6 and 7.

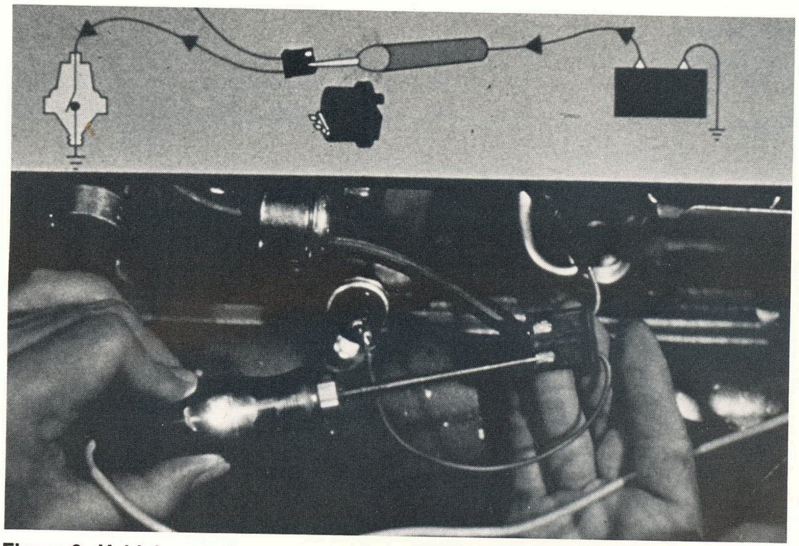

Figure 6. **Vehicles equipped with automatic transmissions . . .**

Connect the test lamp to the battery positive post.

Insert the probe into the solenoid control switch wire terminal.

Start the engine and put the transmission in "Drive."

Slowly accelerate and decelerate the engine, observing the speeds at which the test lamp goes out (switch opens) and goes on (switch closes). The lamp should go out above 37 mph and come on below 33 mph.

Vehicles equipped with manual transmissions . . .

Connect the test lamp to the battery positive post.

Insert the probe into the solenoid control switch wire terminal.

Put the ignition switch in the "On" position and put the transmission in high gear; the light should go out.

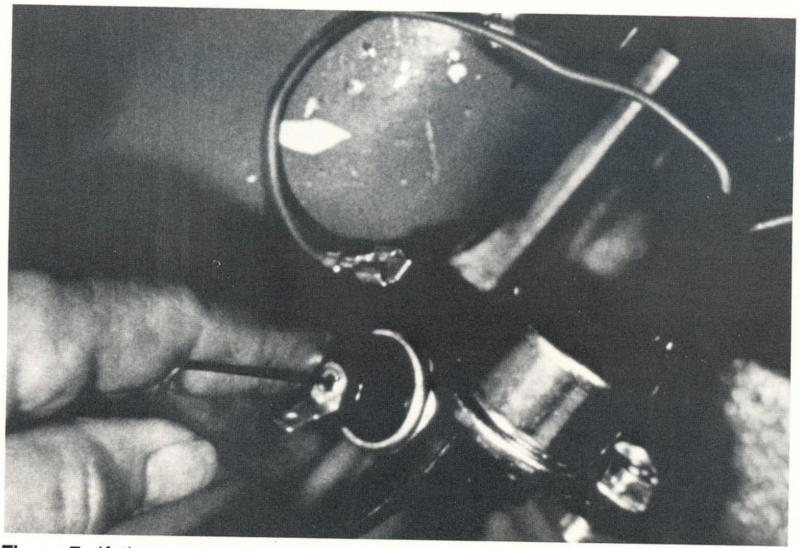

Figure 7. If the operation of the solenoid control switch is outside the proper operating range, perform this adjustment. (To increase opening speed, turn the adjusting screw clockwise.)

If you cannot get the test lamp to go out at all, perform the following test...

The Solenoid Control Switch Test

If the test light did not go out when connected to the wire as described in the previous test, follow the procedure shown in Figure 8.

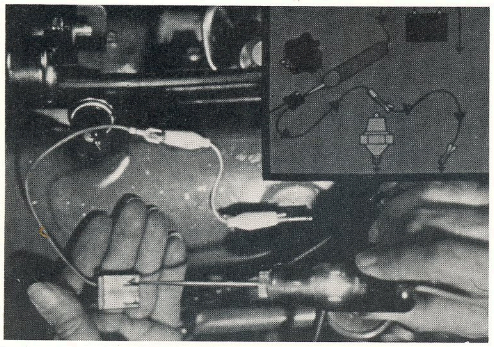

Figure 8. Disconnect the wire from the solenoid control switch and jump it to ground. If the test lamp goes out, the switch is defective and must be replaced.

The Solenoid Vacuum Valve Function Test

To determine if the solenoid vacuum valve is functioning properly perform the following test, shown in Figures 9 and 10. (Note: The engine must be warm for this test.)

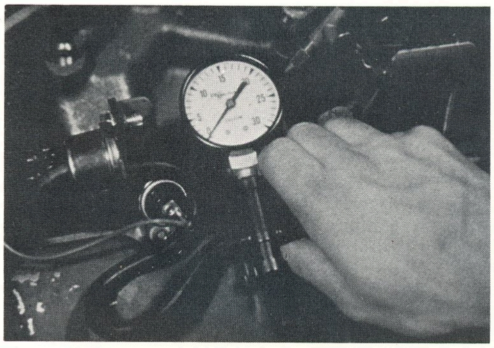

Figure 9. **Vehicles equipped with automatic transmissions . . .**

Place the transmission in "Park."

Disconnect the distributor vacuum advance hose and connect the hose to a vacuum gauge.

Run the engine at 1000-1500 rpm. No vacuum should be indicated.

Vehicles equipped with manual transmissions . . .

Place the transmission in "Neutral."

Disconnect the distributor vacuum advance hose and connect the hose to a vacuum gauge.

Run the engine at 1000-1500 rpm. No vacuum should be indicated.

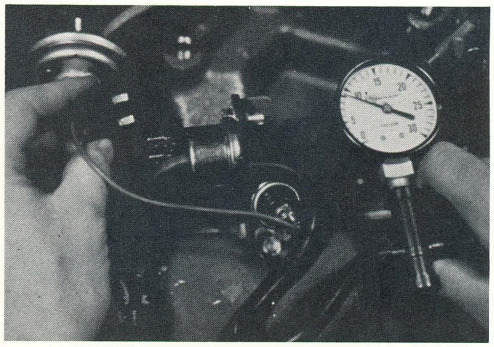

Figure 10. Step 2: While maintaining engine speed, disconnect the two-wire connector from the solenoid vacuum valve. The gauge should now indicate ported vacuum.

If the solenoid vacuum valve does not function correctly, it must be replaced.

SPARK CONTROL SYSTEMS

The Vacuum Spark Control Check Valve Test

The vacuum spark control check valve is utilized on some vehicles equipped with TSC. See the AMC or Jeep Manual for the test procedure used on this component.

QUIZ

SPARK CONTROL SYSTEMS

1. If distributor spark is over-advanced past a certain point, power output drops off but combustion temperature continues to increase. This statement is:
   a. True
   b. False
2. The AMC and Jeep spark control systems reduce the emission of ____ by lowering peak combustion temperatures.
   a. hydrocarbons
   b. carbon monoxide
   c. nitrogen oxides
   d. all of the above
3. The CTO Switch and the non-linear vacuum regulator valve both operate on engine coolant temperature. This statement is:
   a. True
   b. False
4. When the CTO switch on a cold engine is being tested, the vacuum gauge should indicate _____ .
   a. intake manifold vacuum
   b. carburetor ported vacuum
5. When the solenoid vacuum valve is energized, vacuum is allowed to pass through the valve. This statement is:
   a. True
   b. False

Answers: 1. (a) 2. (c) 3. (b) 4. (a) 5. (b)

THE EXHAUST GAS RECIRCULATION (EGR) SYSTEM

There are a number of routine procedures you should be familiar with here:

- **Exhaust System Diagnosis**
- **EGR Valve Maintenance**
- **The EGR Valve Opening Test**
- **The EGR Valve Closing Test**
- **The EGR CTO Switch Test**
- **The Non-Integral Exhaust Back-Pressure Sensor Test**
- **Restrictor Plate Replacement**

EXHAUST SYSTEM DIAGNOSIS

The condition of the exhaust system may affect EGR operation. Excessive back-pressure from exhaust system restrictions may create driveability problems.

Leaks in the system may decrease back-pressure enough to prevent proper EGR operation. This will increase exhaust emissions.

Refer to the AMC and Jeep Technical Service Manuals for complete exhaust system diagnosis procedures.

EGR VALVE MAINTENANCE

Lead and/or carbon deposits tend to build up on the metering pintle and, on some valves, in the exhaust gas discharge passage.

To remove these deposits, follow the procedure shown in Figures 11 through 13.

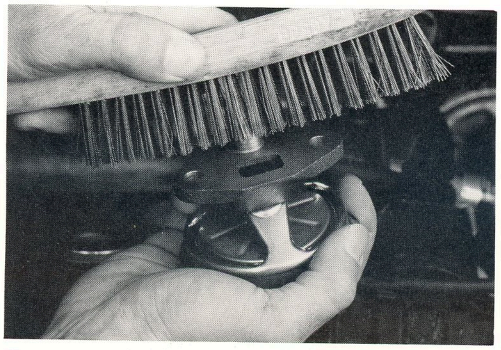

Figure 11. Step 1: Use a wire brush to quickly remove deposits from the stainless steel metering pintle.

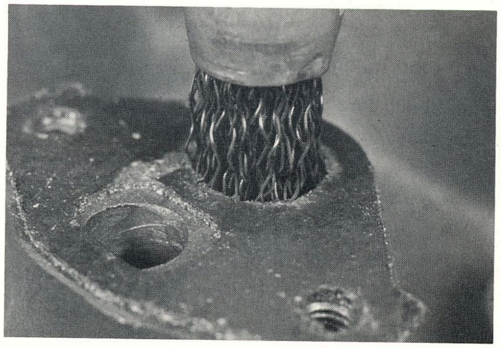

Figure 12. Step 2: Use a spiral-type wire brush to remove any deposits from the exhaust gas discharge passage.

If this procedure does not remove all of the deposits...

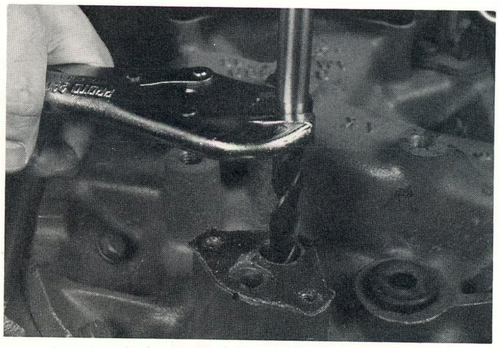

Figure 13. Step 3: Coat the tip of a 9/16-inch drill bit with heavy grease. Then, use locking pliers to rotate the bit in the discharge passage.

THE EXHAUST GAS RECIRCULATION (EGR) SYSTEM

THE EGR VALVE OPENING TEST

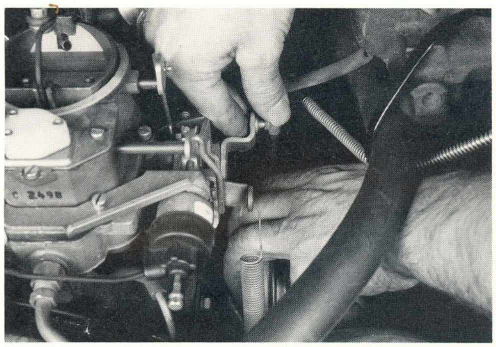

Figure 14. With the engine at operating temperature and curb idle, rapidly open and close the throttle. (The throttle should be opened sufficiently for the engine to reach 1500 rpm.)

A definite movement should be noticed in the EGR diaphragm. If the diaphragm does not move, the probable causes are:

- A faulty vacuum signal to the EGR valve;
- A defective non-integral back-pressure sensor.
- A defective EGR valve.

THE EGR VALVE CLOSING TEST

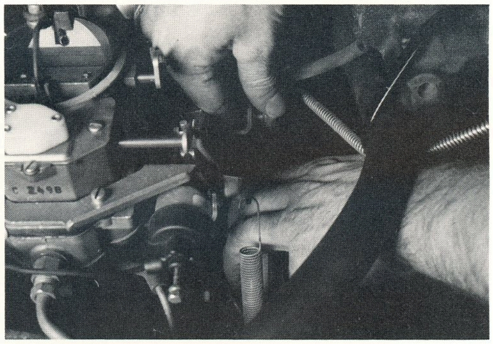

Figure 15. With the engine at operating temperature and curb idle, manually depress the EGR valve diaphragm. This should cause an immediate drop in engine speed, which tells you that the valve has been properly cutting off the flow of exhaust gases at idle.

If there is no change in engine rpm and the engine is idling properly, exhaust gases are not reaching the combustion chamber. The probable cause is a plugged passage between the EGR valve and the intake manifold.

If the engine idles poorly and rpm is not greatly affected by your compressing the diaphragm, the EGR valve is not closing off the flow of exhaust gases. There is a fault in the hoses, hose routings or the EGR valve itself.

THE EXHAUST GAS RECIRCULATION (EGR) SYSTEM

THE EGR CTO SWITCH TEST

To check the operation of the EGR CTO switch, the engine must be cold.

Make sure there are no leaks in the vacuum lines.

Then follow the procedure outlined in Figure 16:

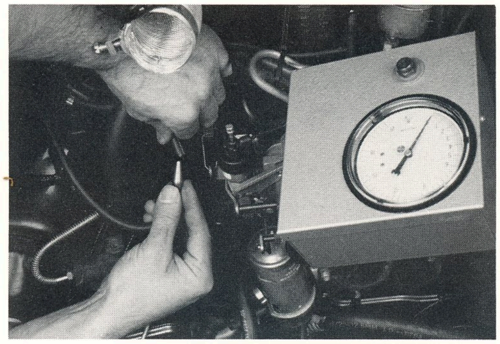

Figure 16. Disconnect the vacuum line at the EGR valve or non-integral back-pressure sensor. Connect the line to a vacuum gauge.

Operate the engine at 1500 rpm, no vacuum should be indicated. If vacuum is indicated, replace the EGR CTO switch.

Let the engine idle until the coolant temperature exceeds the opening temperature.

Accelerate the engine to 1500 rpm. The gauge should indicate carburetor ported vacuum. If not, replace the EGR CTO switch.

THE NON-INTEGRAL EXHAUST BACK-PRESSURE SENSOR TEST

Some vehicles are equipped with this component. To check its operation, follow the procedure shown in Figure 17.

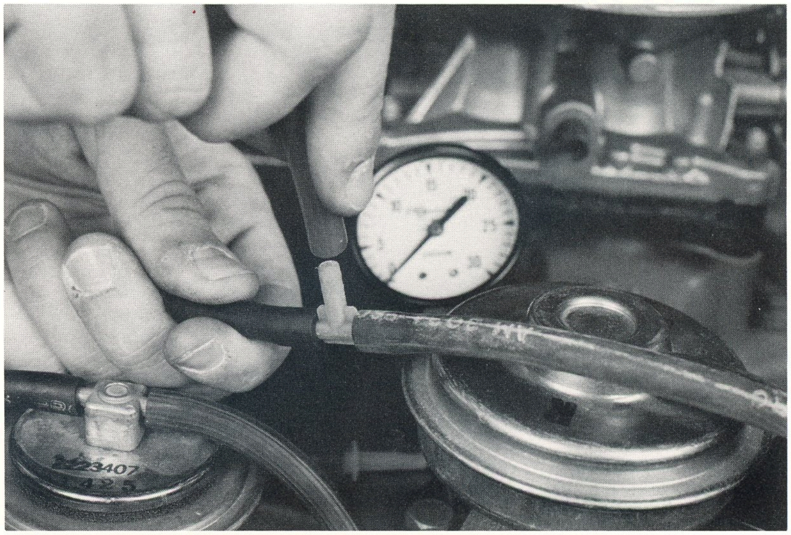

Figure 17. First, inspect all of the EGR vacuum lines for leaks and correct routing. Then, install a tee in the vacuum line between the EGR valve and the non-integral back-pressure sensor.

Attach a vacuum gauge to the tee.

Start the engine and let it idle. No vacuum should be indicated.

NOTE: If vacuum is indicated at idle speed, double-check the vacuum connections. (Be sure that manifold vacuum is not being used as the vacuum source.)

If ported vacuum is being provided (as it should be), check for a partially-open throttle plate. This condition could apply to premature ported vacuum to the back-pressure sensor.

Accelerate the engine to 2000 rpm and observe the vacuum gauge. If the coolant temperature is below the opening temperature of the particular CTO switch, no vacuum should be indicated.

When the coolant temperature has exceeded the opening temperature of the CTO switch, carburetor ported vacuum should be indicated. If no vacuum is indicated during this step, check for vacuum at the inlet side of the non-integral back-pressure sensor. If vacuum is present here, remove the back-pressure sensor and remove any carbon or lead deposits.

If you still have not located the problem, replace the back-pressure sensor.

THE EXHAUST GAS RECIRCULATION (EGR) SYSTEM

RESTRICTOR PLATE REPLACEMENT

If you find it necessary to replace a restrictor plate, be aware of the important tip explained in Figure 18.

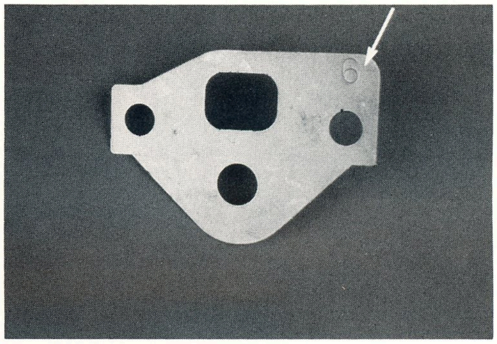

Figure 18. All restrictor plates are calibrated for a particular engine/exhaust system combination. This calibration is indicated by the part number stamped on the plate. (The last digit indicates the calibration.)

If you have occasion to replace a restrictor plate, be sure that the replacement bears the same part number.

QUIZ

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

1. The EGR system limits the formation of ________ by diluting the air-fuel mixture with a metered amount of exhaust gas.
   - a. hydrocarbons
   - b. carbon monoxide
   - c. nitrogen oxides
   - d. all of the above
2. The exhaust gas recirculation process takes place only when ________.
   - a. the engine has warmed to a calibrated temperature
   - b. engine load is sufficient to permit proper EGR operation
   - c. both a and b
3. A restrictor plate is located between the EGR valve and the intake manifold on some vehicles. When this plate is replaced, it *must* be replaced with one bearing the same identification number. This statement is:
   - a. True
   - b. False
4. If lead or carbon deposits accumulate on a metering pintle or in the exhaust gas discharge passage, the EGR valve must be replaced. This statement is:
   - a. True
   - b. False
5. With the engine at operating temperature and curb idle, the engine speed should ________ when the EGR valve diaphragm is manually depressed.
   - a. increase
   - b. decrease

Answers: 1. (c) 2. (c) 3. (a) 4. (b) 5. (b)

American Motors
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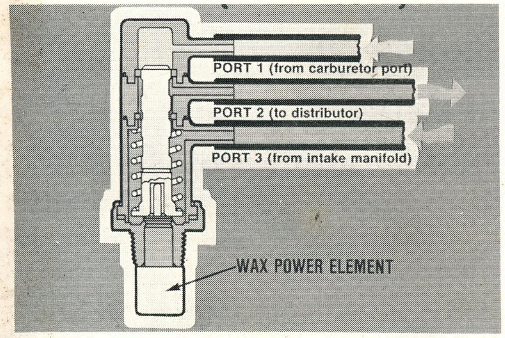
FORM 718779601RB

American Motors Sales Corporation

Evaluation Questionnaire

FIELD EVALUATION - RELEASE 79-6
EMISSION CONTROLS PART II

Our objective in issuing these service training kits is to communicate to you the latest information available on each topic, in the most interesting and educational format. With your help, we can find out if we are meeting that goal. Please take a few minutes to answer the questions below. Fold and staple this sheet as shown and drop it in the mail. No postage necessary.



1. This slide best illustrates the dual function CTO switch in the ____________ position.

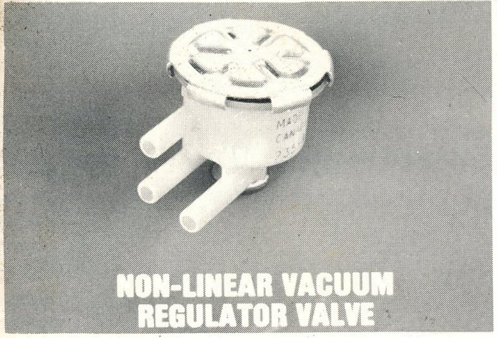
   a. cold　　b. warm　　c. overheated

2. The air guard system is designed to inject air into the exhaust manifold at all times, except during ____________ .

   a. acceleration　　b. deceleration　　c. constant throttle

3. The EGR valve helps reduce ____________ by recirculating exhaust gas into the intake manifold.

   a. HC　　b. CO　　c. NOX



4. The non-linear vacuum regulator valve, shown here, uses ____________ to control distributor vacuum advance.

   a. manifold vacuum　　b. ported vacuum　　c. both a and b

5. Emission Controls Part II covered the systems used to combat potential pollutants. Name two of the systems.

   1. ____________
   2. ____________

6. In Emission Controls Part II, we used a different type of training system, involving on-the-spot quizzes of film and reference material. Would you like us to continue to use this type of presentation?

   ☐ Yes　　☐ No　　☐ Don't Care

7. In general, did you feel the training film and kit materials were:

   ☐ Good　　☐ Fair　　☐ Poor

8. Additional comments (future film topics, etc.) ____________

ATTENTION: SERVICE MANAGER

- Did you hold a Service Meeting to show this film?

  ☐ Yes　　☐ No

- How many people have used this training program? ____________

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